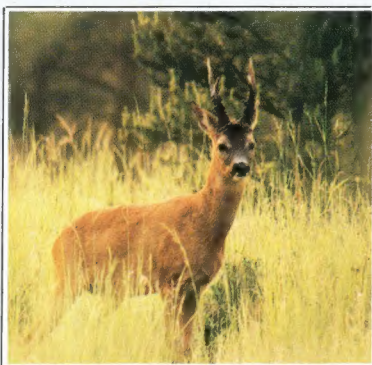




norma

Precision Ammunition



Biggest in Europe!

Read about Europe's biggest moose ever!

PPC - The new bullet

PRJ-80

Development is the main-spring of human endeavour. The endeavour is to improve. New and improved products appear suddenly on the market and are offered to us, but behind them often lie years of development work.

At Norma, we are continually looking forward. In 1978, we were discussing the sales potential of a new hunting bullet.

What were we looking for? Our bullets were already well accepted. Good expansion and with excellent accuracy. Obviously, we wanted all of this, but could these qualities be combined with less destruction of valuable meat? We envisaged a bullet with delayed initial expansion becoming rapid when the bullet reached vital organs.

Our technicians considered the requests. Already early in 1979 blue prints and hand made prototypes were available. It was an exciting time. Would the laboratory tests confirm that we were on the right track? Would it be possible to undertake volume production?

The bullet was given a working name — PRJ 80 — A bullet for the 80's. Around midsummer we were well under way. Everything seemed to work in the laboratory. A new bullet had been born.

The baptism of fire took place during the 1979 hunting season. A very limited series of bullets had been loaded and tested in actual hunting. The results were surprising. Of 27 moose shot, 22 fell instantly, 4 ran 20—55 yds., 1 just over 200. In all 30 rounds were used. Throughout very little meat was destroyed.

In 1980, the bullet design was perfected. During the 1980 season, the bullet was tested on a larger scale. About 2000 bullets were used in several calibres. The result form the previous year seemed to repeat itself. Late in 1980, we introduced minor ad-

justments to get an absolutely even product when mass produced. The new product was ready.

There now remained the verdict of the hunters. In 1981, we invited Swedish hunters to test the new bullet. We also gave them the opportunity to submit a test report and to apply to become a Norma test hunter. The interest was astounding. More than 200,000 cartridges were used. Almost 600 reports were received. It may at first appear to be a limited response, but it is worth noting that we asked a lot of our test hunters, particularly as far as description of sequences of events, measuring wound channels, retrieval of expanded bullets etc was concerned.

Expansion and penetration

The essence of hunting is that game should be killed without causing unnecessary suffering. Vital, life sustaining organs should be destroyed as quickly and as effectively as possible. In almost all big game hunting expanding bullets are used. It is, however, also in the interest of hunters that a minimum of meat is destroyed.

The expansion of a bullet is determined by the design of the tip, the jacket material and its thickness, the core and the velocity. To ensure expansion, even at low velocities over long distances, the jacket must be sufficiently open at the tip. The Norma PPC has a shallow cavity ①. The uninitiated may get the impression that it is a hollow point, but this is not so.

In fact, the main feature of the Norma PPC is the double jacket at the tip. ②. This

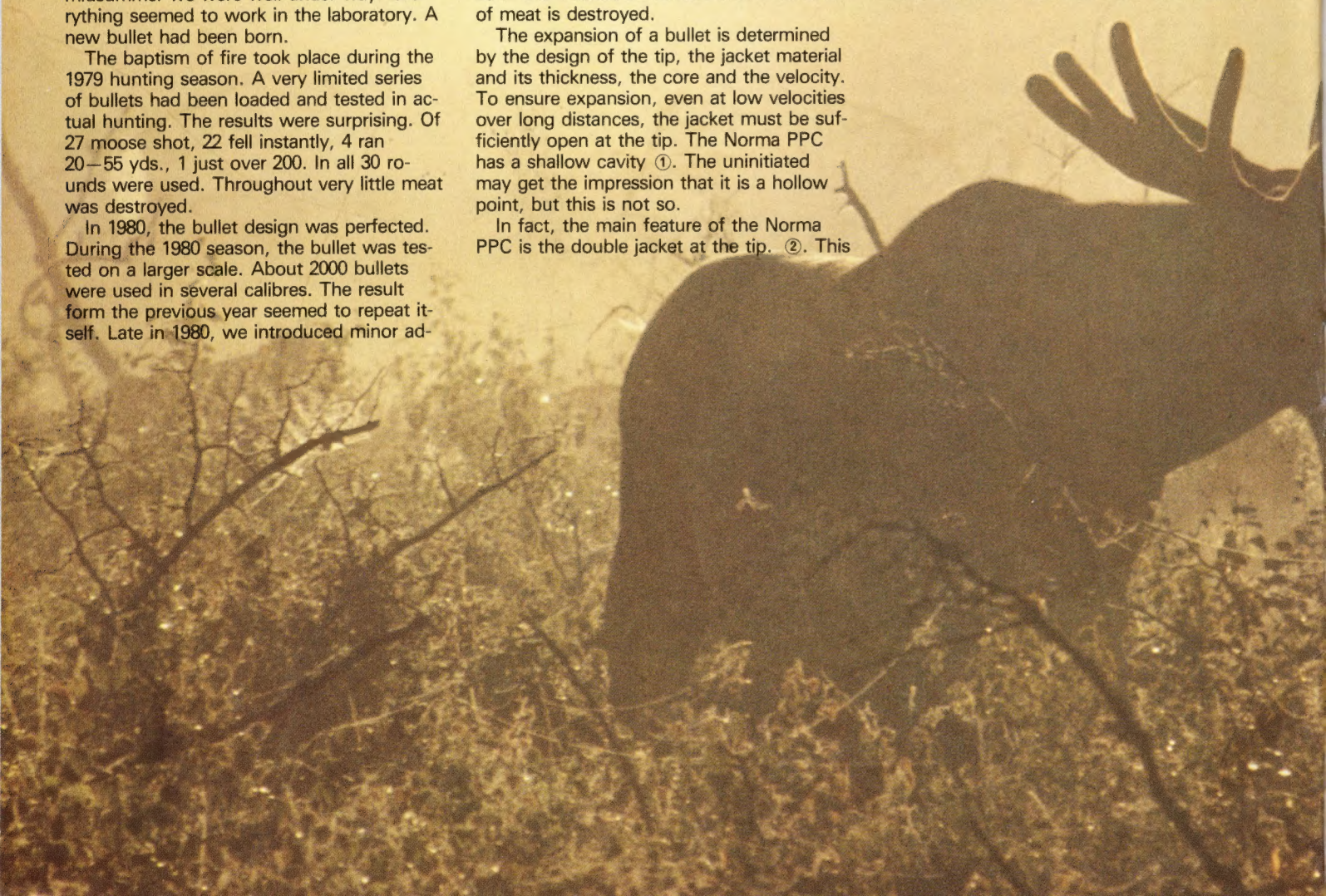
reinforces the opening and delays expansion. The bullet penetrates deep into the tissue before the mushrooming begins. Once it has started, however, it is very rapid. The destruction of meat is limited, but the effects in deep lying organs are substantial.

When the jacket is rolled at the tip, internal folds are formed ③ which in turn guide the mushrooming once it has started.

The third advantage of the tip of the PPC is that it cannot be damaged in the magazine by the recoil from the previous shot or when being chambered.

The thickness of the jacket increases from the tip towards the crimping groove, first quite dramatically, then less so. ④. This construction enables the entire expansion phase to be controlled although it all happens in a fraction of a second. The jacket, which is made of an elastic and carefully controlled alloy of 90% copper and 10 zinc, forms a supporting surface for the lead mushroom.

The PPC core ⑤ consists of an antimony alloyed lead. The design of the tip and careful match of jacket, material and thickness have eliminated the need for a dual lead co-



et from Norma

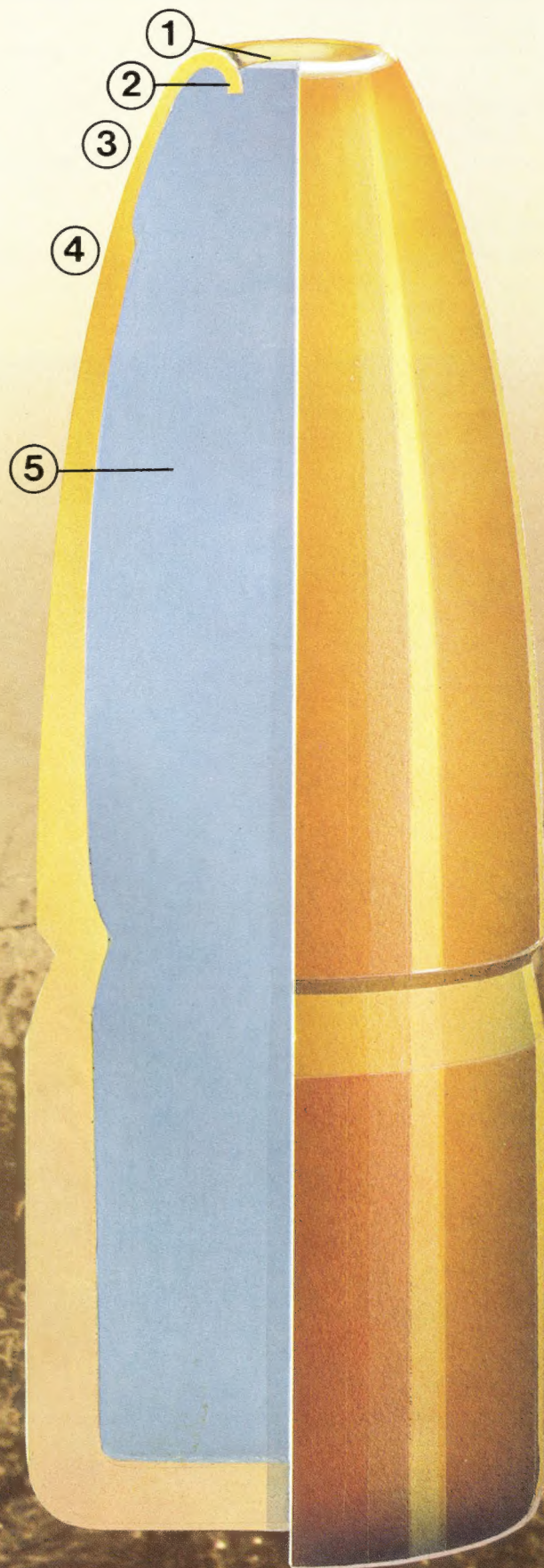
re. This is one of the lessons learnt in our laboratory tests, but also an experience gained in the field. A divided lead core may give problems of separation and loss of accuracy.

The thin jacket always folds back on expansion. This enables the heavy lead core which contains the bulk of the energy to receive the entire retardation in live tissue. The jacket can follow without coming into contact with and being stopped by the tissue. Instead, it tends to push and give support to the lead mushroom and, as a result, the jacket and core very rarely separate.

An expanded Norma PPC has therefore a very high residual weight. This is necessary for penetration. Penetration in turn is a necessity for the destruction of the nervous systems of both halves of the animals body. This creates a shock in the central nervous system and the animal goes down.

PPC is being developed and tested in other calibres and bullet weights.

Norma PPC is now available in the following calibres:



Calibre	Ref.	Calibre		Velocity/ft/s		Energy ft lbs	
		gram	grains	Muzzle	V100	Muzzle	E100
6,5x55	16558	9,0	139	2854	2659	2512	2181
30-06	17659	11,6	180	2700	2496	2913	2490
308 Win.	17660	11,6	180	2610	2411	2722	2322
8x57 JS	18017	10,7	165	2854	2524	2984	2334
9,3x57	19305	15,0	232	2329	2032	2788	2122
9,3x62	19317	15,0	232	2625	2307	3540	2734

Rifle ammunition

	22 HORNET · Ref. 1560 ^{1) 3)}	220 SWIFT · Ref. 15701	222 REM. · Ref. 15711	222 REM. · Ref. 15712	222 REM. · Ref. 15713	222 REM. · Ref. 15714	22-250 · Ref. 15733	5,6x52 R (22 Sav. H.P.) 15604	5,6x52 R (22 Sav. H.P.) 15605	243 WIN. · Ref. 16002	243 WIN. · Ref. 16003	6.5 JAP. · Ref. 16531	6.5 JAP. · Ref. 16532	6.5 CARCANO · Ref. 16536 ¹⁾	6.5 CARCANO · Ref. 16535	6.5x55 · Ref. 16550 ¹⁾	6.5x55 · Ref. 16557	6.5x55 · Ref. 16558 NEW	6.5x55 · Ref. 16559 NEW	6.5x55 · Ref. 16552	270 WIN. · Ref. 16902	270 WIN. · Ref. 16903	7x57 · Ref. 17002	7x57 R · Ref. 17005	7 MM REM. MAG. · Ref. 17021	7x64 · Ref. 17013	7x64 · Ref. 17014 ¹⁾	7.5x55 SWISS · Ref. 17511	30 US CARBINE · Ref. 17621
Bullet type	HP	SPSP	SPSP	FJSP	FJSP	SPSP	SPSP	SPSP	FJSP	FJSP	SPSP	SPSPB	SPRN	PP-DC	SPRN	SPSP	PP-DC	PPC	SP-N	SPRN	SPSP	SPSP	SPSP	SPSP	SPSP	SPSP	SP-N	SPSPB	SPRN
Bullet weight grams	2.9	3.2	3.2	3.2	3.2	3.4	3.4	4.6	4.6	6.5	6.5	9.0	10.1	9.0	10.1	5.0	9.0	9.0	9.1	10.1	8.4	9.7	9.7	9.7	9.7	9.7	11.3	11.6	7.1
Bullet weight grains	45	50	50	50	50	53	53	71	71	100	100	139	156	139	156	77	139	139	140	156	130	150	150	150	150	150	175	180	110
Bullet ref.	65601	65701	65701	65702	65702	65704	65704	65604	65605	66002	66003	66531	66532	66512	66532	66551	66512	66533	—	66532	66902	66903	67002	67002	67002	67002	67036	67625	6761
Vel. muzzle f.p.s.	2428	4110	3200	3200	2790	3117	3707	2790	2790	3070	3070	2362	2065	2576	2430	2725	2790	2854	2854	2495	3140	2800	2755	2690	3250	2890	2725	2650	197
Vel. 100 yds. f.p.s.	1896	3611	2650	2610	2235	2670	3192	2329	2329	2790	2790	2185	1871	2379	2208	2362	2630	2659	2667	2271	2884	2616	2539	2476	2960	2625	2533	2461	159
Energy muzzle ft lbs	589	1877	1137	1137	863	1142	1616	1226	1226	2090	2090	1722	1481	2046	2046	1271	2402	2512	2532	2153	2847	2616	2530	2411	3519	2779	2884	2807	948
Energy 100 yds. ft lbs	360	1448	780	756	554	838	1198	855	855	1730	1730	1473	1213	1745	1689	956	2136	2181	2210	1787	2401	2280	2148	2042	2919	2295	2493	2420	622

SPSP — Soft point semi pointed. SPSPB — Soft point semi pointed boattail. SPSP — Soft point Spire point. SPRN — Soft point round nose. SPFN — Soft point flat nose. SP-A — Soft point Alaska. 20 cartridges per box. ¹⁾ Available until current stock exhausted. ²⁾ Preliminary specification. ³⁾ 50 cartridges per box.



7.62 RUSSIAN · Ref. 17634		300 WIN. MAG. ²⁾ 17680 NEW		30-06 · Ref. 17640		30-06 · Ref. 17643		30-06 · Ref. 17648		30-06 · Ref. 17649		30-06 · Ref. 17653		30-06 · Ref. 17659 NEW		30-30 WIN. · Ref. 17630		30-30 WIN. · Ref. 17631		308 WIN. · Ref. 17623		308 WIN. · Ref. 17624		308 WIN. · Ref. 17628		308 WIN. · Ref. 17635		308 WIN. · Ref. 17636		308 WIN. · Ref. 17660 NEW		308 NORMA MAG. ²⁾ Ref. 17638		7.65 ARGENTINE · Ref. 17701		303 BRITISH · Ref. 17712		303 BRITISH · Ref. 17713 ¹⁾		7.7 JAP. · Ref. 17721		7.7 JAP. · Ref. 17722		8x57 J · Ref. 17901 ¹⁾		8x57 JS · Ref. 18017 NEW		8x57 JS · Ref. 18003		8x57 JS · Ref. 18007		9.3x57 · Ref. 19305 NEW		9.3x57 · Ref. 19302 ¹⁾		9.3x57 · Ref. 19303		9.3x62 · Ref. 19317 NEW		9.3x62 · Ref. 19314 ¹⁾		9.3x62 · Ref. 19315	
SPSPB	SPSPB	SPSP	SPSP	SP-A	SP-N	PP-DC	PPC	SPFN	SPFN	SPSP	SPSP	PP-DC	SP-N	SP-A	PPC	PP-DC	SPSP	SPSP	SPSPB	SPSP	SPSPB	SP-A	PPC	SP-A	PP-DC	PPC	PP-DC	SP-A	PPC	PP-DC	SP-A	PPC	PP-DC	SPSP	SPSP	SPSPB	SPSP	SPSPB	SP-A	PPC	SP-A	PP-DC	PPC	PP-DC	SP-A	PPC	PP-DC	SP-A															
11.6	11.6	8.4	9.7	11.6	11.6	11.6	11.6	9.7	11.0	8.4	9.7	11.6	11.6	11.6	11.6	11.6	11.6	9.7	9.7	11.6	8.4	11.6	12.7	10.7	12.7	12.7	15.0	18.5	18.5	15.0	18.5	18.5	15.0	18.5	18.5	11.6	8.4	11.6	12.7	10.7	12.7	12.7	15.0	18.5	18.5	15.0	18.5	18.5															
180	180	130	150	180	180	180	180	150	170	130	150	180	180	180	180	180	180	150	150	180	130	180	196	165	196	196	232	286	286	232	286	286	232	286	286	180	180	130	150	180	180	180	180	180	180	180	180	180	180														
67625	67625	67623	67624	67648	—	67628	67653	67630	67631	67623	67624	67628	—	67648	67653	67628	67701	67701	67713	67713	67711	67713	67901	68017	68003	68007	69305	69303	69315	69305	69303	69315	69305	69303	69315	67625	67625	67623	67624	67648	—	67628	67653	67630	67631	67623	67624	67628	—	67648	67653												
2575	3020	3205	2970	2700	2700	2700	2700	2329	2133	2900	2860	2610	2610	2610	2610	3020	2660	2720	2540	2950	2495	2525	2854	2525	2525	2329	2065	2065	2625	2360	2360	2329	2065	2065	2625	2575	3020	3205	2970	2700	2700	2700	2329	2133	2900	2860	2610	2610	2610	2610													
2382	2782	2876	2680	2493	2513	2496	1998	1808	2590	2570	2400	2400	2393	2411	2815	2386	2440	2340	2635	2292	2195	2524	2195	2195	2032	1818	1818	2307	2088	2088	2032	1818	1818	2307	2382	2782	2876	2680	2493	2513	2496	1998	1808	2590	2570	2400	2400	2393	2411														
2650	3645	2966	2943	2914	2914	2914	2913	1806	1717	2428	2725	2725	2725	2725	2722	3646	2354	2465	2579	2513	2484	2778	2984	2778	2778	2788	2714	2714	3540	3544	3544	2788	2714	2714	3540	2650	3645	2966	2943	2914	2914	2914	2913	1806	1717	2428	2725	2725	2725	2725													
2268	3093	2388	2393	2484	2524	2524	2490	1330	1234	1937	2200	2303	2303	2287	2322	3167	1894	1983	2189	2004	2100	2097	2334	2097	2097	2122	2099	2099	2734	2769	2769	2122	2099	2099	2734	2268	3093	2388	2393	2484	2524	2524	2490	1330	1234	1937	2200	2303	2303	2287													

SP-N = Soft point Nosler. PP-DC = Plastic/Pointed Dual-Core. FJSP = Full jacket semi pointed. HP = Hollow point. PPC = Protected Power Cavity. Further details in our "Ballistics Table"

norma
Cartridges
222 REM.

norma
Cartridges
6.5x55

norma
30-06

300 Win. NEW Mag.

Cartridge ref. 17680
Bullet weight 180 grains
11.6 grams
Soft point semi pointed boattail
Muzzle velocity 3020 feet/sec.
Velocity 110 yds 2782 feet/sec.

Terminal ballistics — the bullet and the game



Design of a bullet

The first bullets used for hunting were made of lead. They were round balls, a word still being used although today's hunting projectile is no "ball" in the true sense.

New powders gave higher velocities and this rendered pure lead useless. A tougher material was needed. The solution was to keep the lead a core, but cover it with a thin envelope of stronger metal. This became the jacketed bullet.

Today's hunting bullets can be either fully or partly jacketed. A common expression is that they are fully or semi-jacketed. The semi-jacketed bullet is often a soft point, which is in fact more correct, as it is mainly the tip which has been left uncovered. A fully-jacketed bullet is not usually



Full jacket.



Soft point.

deformed on impact in targets of normal density and hardness. It retains its shape and diameter which means that it is only marginally retarded when passing through game. In practical terms this means that as a rule it penetrates the game and only slightly loses its energy, resulting only in a wound channel of the same calibre. Only at extreme velocities will the jacketed bullets give a large wound channel as a result of the shock wave effect. A high velocity bullet can literally "explode" small game. Used on big game the fully jacketed bullet, even at high velocities, would have too uncertain an effect.

We prefer the soft point bullet, which on entering is deformed. Such a bullet delivers almost all its energy with the deformation of bullet and tissue. The mushroomed bullet gives a higher degree of wounding.

Velocity is always important

But even a soft point bullet needs the help of velocity to give a sufficiently rapid effect. If a much-roomed bullet could be made to penetrate at low velocity, it would — if positioned correctly — most certainly inflict fatal wounds, but the whole process could easily be prolonged and the animal would probably remain alive for a long time and be able to run far. Such was the effect, even of good shots — at the time when round balls were used at low velocities.

With the high velocities of today, shock waves, contribute considerably to the rapid effects of a shot. These effects are many. The shock wave causes considerable wounds, the tissue in its path is destroyed and leaves a wider wound channel than the bullet can mechanically achieve. Also if large nerve centres on either side of the animal can be destroyed at short intervals, the central nervous system will be blocked and cause a state of shock. If small game is hit by a high velocity bullet, it may immediately be paralyzed by shock, it falls and remains lying. A large game animal will not always react in this fashion even if hit by an extremely rapid bullet, but it is indisputable that the shock will to a large extent contribute to the effect of a shot.

Safety margins

Most shots at big game animals aim at eliminating the lung function of the animal. A hit in the lung area with a modern soft point hunting bullet will achieve this, even if the calibre used is not among to the heaviest of big game cartridges. The lung function ceases immediately, no further oxygen enters the blood, the brains suffers from lack of oxygen and the animal expires as a rule within 20-30 seconds. But if this can be achieved with a cartridge of moderate "strength", why then are high energy cartridges recommended and used for big game hunting? Perhaps the answer is this:

If a bullet reaches and destroys central parts of the lungs, its power at that point is quite sufficient even if the cartridge used to put it in motion is relatively "weak". If I break a bulb using a

30-06, the darkness is no deeper than if I break it using a 222. The purpose is achieved equally well in both cases. Even if I use the most powerful calibre in the world, but place the shot very badly, the result on big game is most probably an extended and difficult search and prolonged suffering for the animal, as if I had hit equally badly with a weak calibre. It is thus immaterial which calibre I have used. The purpose is not achieved in either case.

But between those two extremes there is an intermediate stage and this situation is all too obvious when hunting. The shot was not perfect, but not quite a failure as far as point of impact was concerned. In such a case the built-in safety margins of the heavier calibres is of immense value. Where the weak calibre of low energy and minimal shock effect would have resulted in prolonged suffering and a long search, calibres with energy to spare and high velocities may mean that the animal will not run away and can be quickly despatched.

For the perfect shot, a weak low energy calibre is sufficient even when hunting powerful big game, but the ever-perfect shot requires in turn the ever-perfect hunter.

Is there such a person?



Accurate shooting

The hunter demands — quite rightly — accuracy from his rifle and ammunition. At the same time as the scope has become standard equipment, the accuracy requirement has increased. At the shooting bench, the point of aim at the target can be seen very clearly through the scope and if the support is steady, we believe ourselves able to maintain perfect aim when firing. Having fired our 4-5 rounds, we examine the pattern in the firm conviction that the pattern is almost "hole-in-hole". Everything was just right. The rifle is expensive and high quality, the scope also. The ammunition is first class.

If we approach the target with those expectations, we may be in for a disappointment. The pattern is probably not a "hole-in-hole", it is more likely one here and one there. As a rule the dispersion is so small that, when the result is related to the requirements of practical hunting, it is more than sufficient. But since our aim for each shot was so good, why are not the bullet holes much closer to each other? Why is one to the left and one to the right? Perhaps 2" apart. One up and one down. One clearly higher than all the others. Why...

Accuracy — an equation with many unknowns

The unavoidable dispersion in rifle shooting is, seen as a problem, an equation with a number unknown factors, each of which contributes to give series of rounds a smaller or larger group size at the target. If the dispersion is abnormally large, it indicates there is an obvious and identifiable fault which can be corrected. If the dispersion is more normal we can only strive to reduce it as much as possible. "Zero-dispersion", i.e. a pattern consisting of one hole of calibre diameter is only wishful thinking.

The Shooter

One of the many unknowns of the equation is first and foremost the shooter himself. As a precision tool, man is clearly deficient. "Faults", or rather variations in our behaviour small enough not to be registered by our senses, can cause considerable dispersion at distances less than 100 yds.

The Gun

The gun is the other large factor of dispersion. Even talking here of excellent and well maintained precision weapons, a deficient gun can naturally be the main factor in the same way as a poor shot can.

More often than not we blame the lack of accuracy on the barrel of the gun. Most of the time this is not so. Even a gun barrel with flaws can give acceptable accuracy. Good examples of this were the old home-made muzzle loaders. Most of them had, by today's standards, awful barrels and bores, but there are many well documented cases where good shots were able to achieve exceptionally tight groups at 60—70 yds.. The barrels were thick and heavy, the pressure generated relatively low. The fact that the barrel was crooked or had other flaws did not matter so much once the gun had been sighted in.

It is the total stability of the gun and chiefly the stability of the barrel itself and its mounting which determines the degree of accuracy. Also the relation of the barrel to the supporting and recoil absorbing functions of the stock. Within the short period of time from the ignition of the powder, during the violent build-up of pressure until the bullet leaves the muzzle, a wave of tensions and vibrations move through the barrel. It is these which cause what the experts call barrel oscillations. Heavily exaggerated, the barrel acts as a freely resting or suspended hose ejecting water under full power when the bullet is being driven through the barrel. The muzzle moves more or less in a regular pattern and the point of impact depends on where in this pattern of movement the muzzle pointed at the very moment the bullet left the barrel.

The need for stability in the gun as a total unit is therefore considerable. An insignificant variation in support and tension in any given area results in the corresponding variation in the direction of the bullet. Even very minute variations in the way in which the stock absorbs recoil produces such variation. The progressive warming of the barrel is also another reason for dispersion. The more stable the gun is, as regards action stiffness, exact barrel thread, constant recoil absorption, heavy barrel material etc, the less are the variations in the direction of the bullets leaving the muzzle.

Today most rifles are equipped with a scope. Perhaps, we are not always aware that also the scope, its mounts and its lenses has a built-in dispersion factor. Small for a high quality scope, larger for one of the lesser quality. Often unacceptably large for a cheap one.

Ammunition

Today ammunition is manufactured using exceptionally sophisticated methods and with very high demands on uniformity. Factory loaded ammunition for hunting very rarely gives unsatisfactory accuracy. High quality Match ammunition, however, can only be offered by a few factories. Norma is one of those.

The factors contributing to the dispersion of ammunition are variations in the powder and priming compounds, case volumes and variations in the weight and measurements of the bullets. Also the quality of the powder and variations in cartridge length and bullet pull affect accuracy.

Ammunition variation affects accuracy in two ways. Firstly, it affects and causes barrel oscillations, secondly it causes the bullets to have different barrel times. Barrel time is the time it takes for the bullet to travel the full length of the barrel.

Considering the barrel oscillation, it is obvious that the uniformity of barrel time from round to round is important to eliminate dispersion. Uniformity of barrel time is also important in as much as during the time the bullet travels through the barrel, the recoil has begun. As everybody knows, the recoil causes the muzzle to rise.

This brings us back to the shooter as a factor of dispersion. His ability to absorb the recoil from round to round and to do so in the same manner also affects the size of the group. As a conclusion of the dispersion factors of the shooter, the gun and the ammunition, we have now learnt that many many factors cause the bullet to deviate from the desired point of impact. We have also learnt that many of these factors affect and interact with each other. If a bullet is only marginally thicker than the previous one, the pattern of barrel oscillations is affected. But also the barrel time. In turn both factors affect the point of impact. Accuracy is thus not only an equation with many unknown factors as we initially pointed out. These factors can also be functions of each other. And the ammunition manufacturer is expected to understand and control all these factors from cartridge to cartridge to cartridge. This we do at Norma.



Everyday ballistics

The drop of a bullet

During the short period of time the bullet is in flight between the gun and the target, it is affected by the earth's gravity. This effect is exactly identical if we drop the bullet and let it fall straight down or if we propel it at high velocity from a gun. The forward movement does not affect the time of the fall.

We can illustrate this by playing with a marble on a table. A couple of feet from the table is a wall. First we let the ball fall over the edge of the table and hit the floor. We are able to establish that the fall took .5 seconds. The next time we strike the ball so that it flies out into the room and hits the floor some distance from the table. The time of fall is exactly as before.

Now we bend a plastic ruler and flick the ball at high velocity. This time it does not fall to the floor, but hits the wall instead. It can be expressed thus that it did not have time to fall to the floor as it reached the wall in shorter a time than the fall time.

If we imagine that the marble reached the wall in .25 seconds, i.e. in half of the previous fall time, we can establish that the point of impact on the wall is located 3/4 of the height of the table from the floor. By bending the ruler harder and harder for every new attempt, we will be getting a higher and higher point of impact on the wall. That is to say that through increased velocities the marble gets a flatter trajectory.

Flight time

What we have so far described is nothing but the laws of ballistics, i.e. the science of a bullet in flight. A bullet propelled horizontally will always fall a certain distance during flight, but by reducing the time of flight, we can reduce the drop. The time of flight can be reduced in three different ways.

1. By increasing the velocity of the bullet.
2. By improving the ballistic shape of the bullet, so that it retains its velocity better, i.e. the resistance of the air is less.
3. By increasing the weight of the bullet with retained or only marginally reduced muzzle velocity, so that the air resistance, relatively speaking is less, thus increased kinetic energy.

All these three measures aim at reducing the time of flight. It is this only which determines how much a bullet drops during its flight from the gun to the target. As the distance of the drop is proportional to the square of the flight time, a reduction of the flight time by half means that the drop is only 1/4.

High point of impact

If we continue to play with the marble and the plastic ruler, we soon find that we will never be able to give the marble such a high velocity that it hits the wall at the same height as the table top. In other words, we can never achieve an absolutely flat trajectory; the marble always drops somewhat.

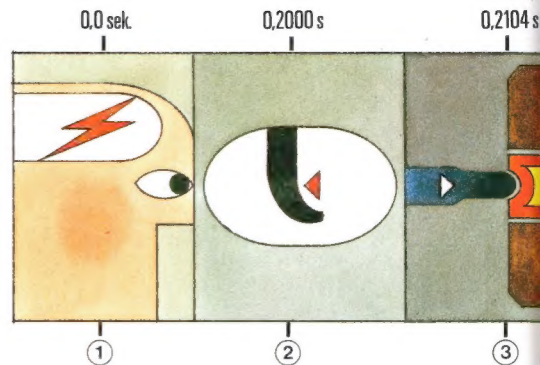
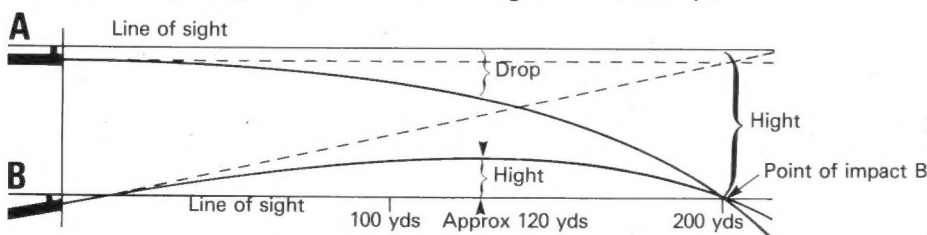
To ensure that the marble hits the wall at the same height as the table, there is only one possibility left. We must propel the marble at an angle upwards.

We aim and find that at approximately half-way the marble reaches a point which is further from the floor than when it left the table top and also higher than the desired point of impact on the wall. When sighting-in a rifle for such a distance that we must compensate for the drop of the bullet we always sight-in the high point of impact at all shorter distances relative to the straight line between the muzzle and the point of impact. This high point of impact is not the same as that given by ammunition manufacturers in their trajectory tables. These also consider that the line of sight using open-sights or scopes differs from that of the bullet path and the figures given in the trajectory tables relate to deviations from the line-of-sight. The high point of impact is highest at about half the sighting-in distance. If we sight-in our rifles at 200 yds., the highest point of impact is found at about 120 yds., but at this distance it is only a question of a few fractions of inches and for all practical purposes without significance. If on the other hand, the rifle had not been sighted-in and the bullet fired parallel to the line-of-sight, the drop at 200 yds. would have been considerable and quite unacceptable from a hunting point of view.

In conclusion, through a modest high point of impact at shorter distances, we can compensate for an unacceptable low point of impact at longer distances.

The following schematic drawings attempt to illustrate this. In the first line of drawings, the rifle is sighted-in at 200 yds and the moose standing at that distance is hit correctly, but also the moose at 100 yds has an acceptable hit with the same point of aim. The small "high" is insignificant. On the other hand this sighting-in is unacceptable at 300 yds. The next line of drawings shows a sighting-in at 100 yds. The moose at 100 yds is naturally hit quite correctly, but the one standing at 200 yds receives an unacceptable low hit. (Compare this "low" with the "high" at 100 yds in the previous example.)

A = Guns not yet sighted-in. B = Guns sighted in at 200 yds.



The "long" second

Have you ever wondered exactly what happens at the time of fire? Let's look closer at this fraction of a moment, which when told in words and pictures seems to go on forever.

After all your preparations, you are now out in the field. You can hear something coming. You can hear your own heart beating. There it is! The recticle is right on target. Now! ① From this moment on, all your expectations result in a sequence of events over which you no longer have any control. Everything happens in less than a second.

From the moment you decided to fire, until the moment you actually pulled the trigger and released the firing pin, a fifth of that second has already passed. ② But after .005 seconds, the firing pin hits the

primer, the cartridge ward into the bottom, shoulder against. Then the primer is until it bottoms in the ket. This also took second. The primer is squashed against ignites from the friction count in ten-thousandths .0004 sec! In all .210

The burning primer is thrown in to the pressure forces the backwards against. The back of the primer outside the head of powder ignites and top gases which begin the bullet, the wall the case. ④

The fact that a rifle which has been sighted-in at a relatively long distance always gives a certain "high" at about half the sighted-in distance, can be used as an aid when sighting-in the rifle for those who do not possess a sufficiently long range. By deliberately sighting-in with 1"-2" "high" at 100 yds., we have in fact sighted-in the rifle for a bulls-eye at 150-180 yds. The fact that the

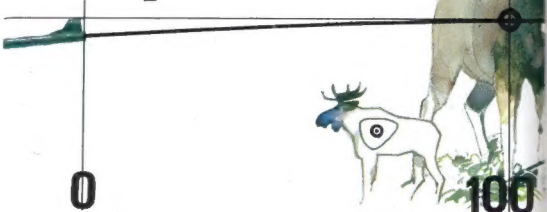
Sighting in distance

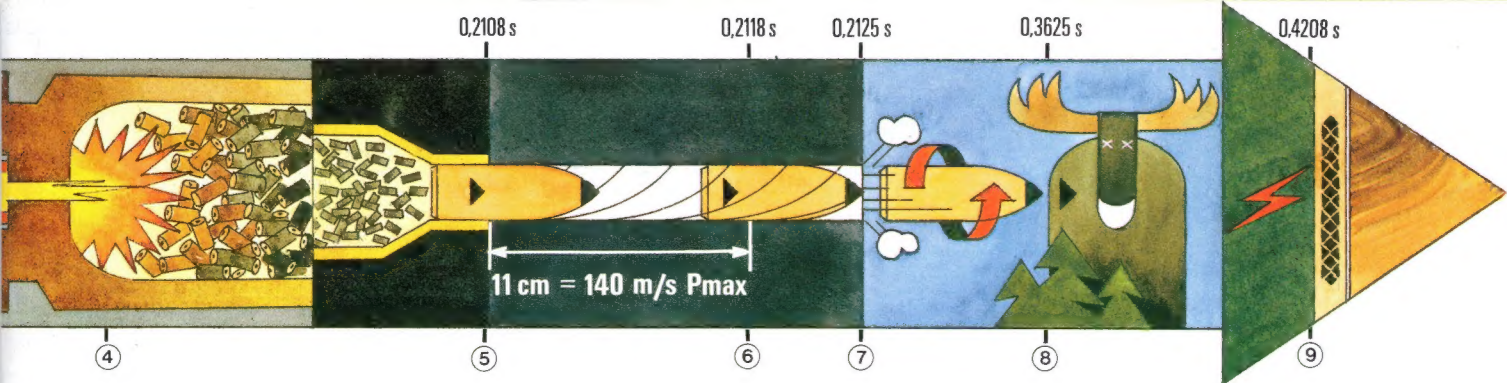
200 yds



Sighting in distance

100 yds





is forced forward of the chamber shoulder. Pushed forward the primer pocket thousands of a cup is being compound the anvil and ion. Now we ends of seconds, 4 sec. ③.

ing compound powder. The primer cup the bolt face. ner now rests the case. The starts to de- ins to work on and bottom of

After only .0003—.0004 sec the bullet starts to move forward ⑤ and the case backwards. At the same time as it expands and seals against the chamber wall, the primer is pushed back against the case.

The pressure peaks after a further .0005 sec. The bullet has moved about 4". The velocity is already 459 feet/sec. ⑥. We leave the time perspective for a moment. Let us assume that you have a 30-06 cartridge with a 180 grain bullet. The bullet and the powder weighs approximately as much as the case and the primer together. If there was no bolt to stop it, the case would now be on its way back against your face at about the same speed. Not a very healthy situation, therefore quickly back to our clock.

The bottom of the case pushes

against the bolt and the whole gun is moving backwards from the same moment that the bullet began to move forward. Only much slower as the gun is much heavier than the bullet and the gases. When the pressure has peaked, the bullet continues forward and increases its velocity, but now it leaves behind it in the barrel an increasing larger volume, than the burning powder is able to fill with more gas of the same pressure. The pressure drops!

The bullet leaves the muzzle at 2700 feet/sec after a journey through the barrel of about .0012 sec. ⑦. It now rotates at about 3000 r/sec in order not to tumble in its continuing travel towards the target. If the distance is 100 yds., the clock will run for a further .15 sec ⑧. The bullet took .36 sec to re-

ach the target from the moment you decided to fire.

How far backwards has the gun travelled? When do you feel the recoil? Well, this has to do with how hard you hold the stock against your shoulder when you pull the trigger. The average speed of the gun is perhaps about 3 feet/sec. When the bullet left the barrel, the gun had moved back perhaps 2/10 of an inch. That movement you probably do not sense as recoil. Let us instead assume that you hold the stock against your shoulder so that the gun moves a total 1/2 inch. backwards in the recoil before you feel it. That takes about .01 sec. After that your reaction time to register is as long as when you pull the trigger, .2 sec ⑨.

Thus, before you are able to feel that recoil about .4 sec. has elapsed.

The bullet has already reached the target and the stock will pound your shoulder a little while yet. Still the gun moves backwards.

But that feeling is exhilarating. Before the barrel rose and the target disappeared from view in the scope, you were able to register the impact of the bullet. A quick tug in the wet fur. That picture will stay with you for the rest of that long second and whenever you think of the moment that led up to it.

gun hits high by about 1"—2" at the shorter distance is of no practical consequence in normal hunting circumstances.

The rising bullet

Hunters sometimes voice the opinion that a certain cartridge or rather a certain bullet rises in comparison to another. This opinion is based on the

undeniable fact that in one and the same gun and without changing the sighting-in, one cartridge can give a point of impact perhaps 4—5 inches higher than another, even at 100 yds., normally a distance far too short to explain differences in bullet drop as a result of flight time. How is this then possible? Are there bullets which contrary to all laws of nature rise instead of fall?

No bullet rises by its own power. **No bullet can rise above the path it was given by the gun.**

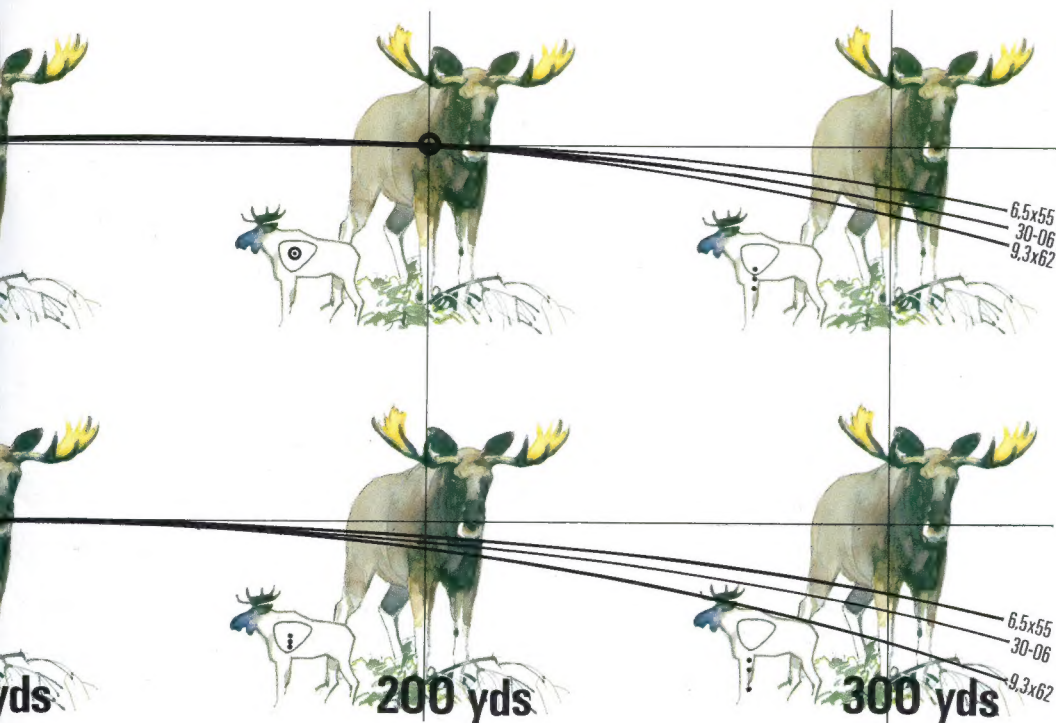
The bullet which has a much higher point of impact than another at 100 yds. has quite simply been given a different, higher direction and this despite the fact that the sighting-in of the gun has not been changed. The barrel oscillations have changed and the recoil and the elevation of the barrel with the new bullet is therefore higher. More about this elsewhere in this catalogue.

Sighting-in eliminates differences

Another firmly held belief is that some calibres are distinct "long distance calibres" while others are only to be used at relatively short distances. Naturally there are certain reasons for such opinions. Some calibres and cartridge types give considerably shorter flight-times and thus also less bullet drop than others, thereby offering certain advantages over long distances. However, the differences are often exaggerated.

Big game calibres currently in use throughout the world give flight times at 200 yds. between .250 to .320 seconds. This includes both very fast and slow calibres. Shooting cartridges representing both these extremes from horizontally aimed (not sighted-in) guns, we get a difference in drop at 200 yds. of 8" (12"—20" respectively.) A difference of 8" may sound a lot even if many are surprised that the difference is not bigger.

But this example applies to guns which have not been sighted-in. If we instead sight-in both these guns at 200 yds., the difference in practical terms is almost insignificant. We now no longer have a difference in drop as both guns hit the bulls-eye at 200 yds. The difference is instead in the high point at about 120 yds. The "slow" calibre is about 3" high, the fast is about 2" high. A difference of 1".



Match Accuracy

What is the most important feature in a Match cartridge — the function or the accuracy?

We at Norma think both.

Each cartridge must function without problems in all guns. Without exception! Doubts about function must never creep in during an important competition.

But accuracy is also extremely important. Precise powder charges, continuous test firing during production and using quality components have made Norma the choice of top competition shooters throughout the world.

That's Match accuracy!

25 ACP NEW



Cartridge ref. 16401
Bullet weight 50 grains
3,2 grams
Full jacket round nose
Muzzle velocity 804 feet/sec.

380 ACP NEW



Cartridge ref. 19031
Bullet weight 95 grains
6,1 grams
Full jacket round nose
Muzzle velocity 1033 feet/sec.

Cartridge ref.	Bullet weight		Bullet type	Bullet			Velocity feet/sec.	Energy ft lbs
	grains	grams		length inch.	diam. inch.	ref.		
25 ACP								
16401	50	3.2	Full jacket round nose <small>NEW</small>	.46	.251	—	804	71
30 Luger								
17612*)	93	6.0	Full jacket round nose ¹⁾	.58	.308	67612	1230	312
32 ACP								
17614	77	5.0	Full jacket round nose	.49	.308	67610	900	139
32 S&W Long								
17810	98	6.4	Lead wadcutter	.57	.314	67810	787	135
380 ACP								
19031	95	6.1	Full jacket round nose ²⁾ <small>NEW</small>	.46	.355	69031	1033	223
9 mm Luger								
19021	115	7.4	Hollow point	.57	.355	69021	1165	350
19022	116	7.5	Full jacket round nose	.60	.355	69010	1165	350
19026	116	7.5	Soft point flat nose	.53	.355	69026	1165	350
38 Special								
19119	110	7.1	Norma Magnum Hollow point ³⁾	.51	.357	69123	1115	302
19110	148	9.6	Lead wadcutter	.65	.357	69110	770	195
19112	158	10.2	Lead round nose	.69	.357	69112	870	266
19114	158	10.2	Full jacket semi wadcutter	.73	.357	69106	900	285
19124	158	10.2	Soft point flat nose	.66	.357	69107	900	285
19125	158	10.2	Hollow point	.68	.357	69101	900	285
357 Magnum								
19101	158	10.2	Hollow point	.68	.357	69101	1450	735
19106	158	10.2	Full jacket semi wadcutter	.73	.357	69106	1450	735
19107	158	10.2	Soft point flat nose	.66	.357	69107	1450	735
44 Magnum								
11103	240	15.6	Power Cavity	.69	.430	61103	1675	1496

50 cartridges per box.

¹⁾ Available until current stock exhausted.

²⁾ Prel. spec. subject to modification.

³⁾ Results obtained in 4" vented barrel.



Ammunition!

Today Norma is one of the worlds leading ammunition manufacturers. However, it all began with Match bullets for the Swedish National Rifle Association.

The shooters of that time — more than 80 years ago — demanded exceptional function, accuracy and consistency. The development of new techniques coupled with skill and pride brought continuously improved products.

Our ambition to meet the high demands of these shooters has meant that today's marksmen have access to some of the world's best ammunition.

Match cartridges to give highest possible returns in all forms of competitive shooting. In all types of guns. Try Norma Accuracy next time!



Norma standard velocity 22 LR for rifle and pistol. Accuracy and function to match all other Norma products!

6,5x55

NEW

Cartridge ref. 16517
Bullet weight 140 grains
9,1 grams

Hollow point
Muzzle velocity 2526 feet/sec.

308 Win. (7,62) Match

NEW

Cartridge ref. 17679
Bullet weight 168 grains
10,9 grams

Hollow point
Muzzle velocity 2549 feet/sec.



Not all thinking hunters think alike

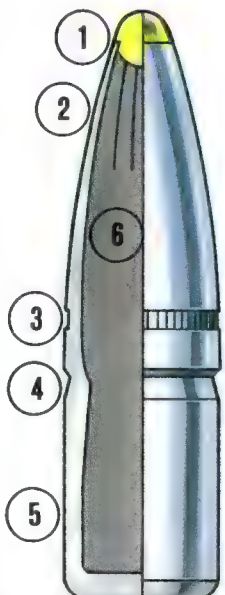
That's why Norma offers a selection of hunting bullets. Bullets with different characteristics for different game. But they have one thing in common. Guaranteed expansion and penetration.

No other ammunition maker in the world can offer so many purpose made bullets for big game hunting as Norma. Take your pick!



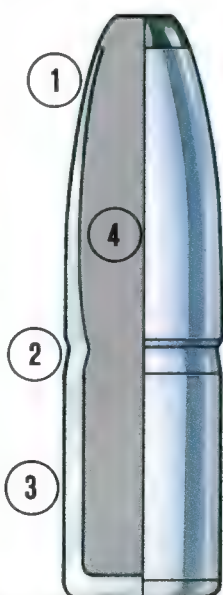
Dual Core

1. Plastic point
2. Thin walled jacket with internal mushrooming grooves.
3. Identification cannellure
4. Cannellure
5. Reinforced jacket
6. Antimony alloyed lead core



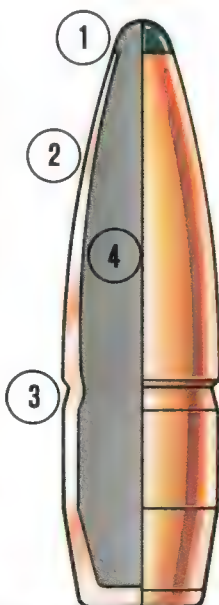
Alaska

1. Thin walled jacket
2. Cannellure
3. Reinforced rear portion jacket
4. Antimony alloyed lead core



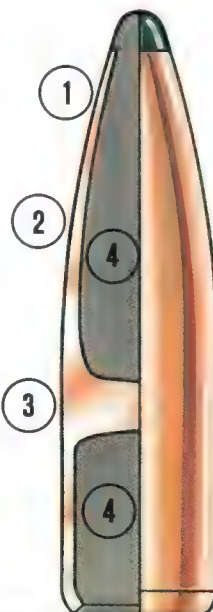
Soft point

1. Soft lead point
2. Tri-clad jacket
3. Cannellure to bond lead core to jacket
4. Antimony alloyed lead core



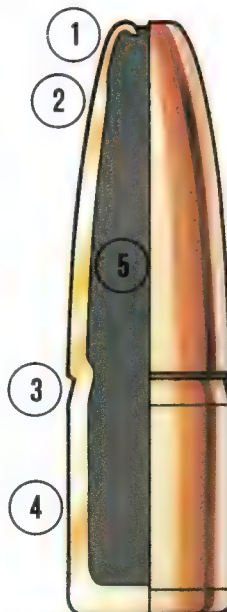
Nosler

1. Thin walled front of jacket
2. All-tombac jacket
3. Partion
4. Antimony alloyed lead cores



PPC **NEW**

1. Jacket folded into the lead core
2. Thin walled jacket with internal mushrooming grooves
3. Cannellure
4. Reinforced rear jacket
5. Antimony alloyed lead core



Load your own - Shoot more

Most components used in Norma cartridges are available for handloading. You can load more cartridges at lower cost for your training. Additional information is available in "Ballistic Tables and Loading Data". It's available from your gun dealer or from Norma.

NORMA BULLETS

Rifle bullets
in boxes of 100.

22 cal. (.224")

Ref. 65601 45 gr/2.9 g HP
Ref. 65701 50 gr/3.2 g SPSP
Ref. 65702 50 gr/3.2 g FJSP
Ref. 65704 53 gr/3.4 g SPSP

5.6 mm (.228")

Ref. 65604 71 gr/4.6 g SPSP
Ref. 65605 71 gr/4.6 g FJSP

6 mm (.243")

Ref. 66002 100 gr/6.5 g FJSP
Ref. 66003 100 gr/6.5 g SPSP

6.5 mm (.264")

Ref. 66551 77 gr/5.0 g SPSP
Ref. 66522 80 gr/5.2 g FJRN
Ref. 66512 139 gr/9.0 g PP-DC¹⁾
Ref. 66516 139 gr/9.0 g FJPBT
Ref. 66531 139 gr/9.0 g SPSPBT
Ref. 66533 139 gr/9.0 g PPC
Ref. 66510 144 gr/9.3 g FJPBT
Ref. 66532 156 gr/10.1 g SPRN

.270 cal. (.277")

Ref. 66902 130 gr/8.4 g SPSP
Ref. 66903 150 gr/9.7 g SPSP

7 mm (.283")

Ref. 67002 150 gr/9.7 g SPSPBT

.30 cal. (.308")

Ref. 67621 110 gr/7.1 g SPRN¹⁾
Ref. 67623 130 gr/8.4 g SPSP
Ref. 67677 130 gr/8.4 g FJRN¹⁾
Ref. 67602 146 gr/9.5 g FJP
Ref. 67624 150 gr/9.7 g SPSP
Ref. 67630 150 gr/9.7 g SPFN
Ref. 67631 170 gr/11.0 g SPFN
Ref. 67625 180 gr/11.6 g SPSPBT
Ref. 67628 180 gr/11.6 g PP-DC
Ref. 67648 180 gr/11.6 g SP-A
Ref. 67653 180 gr/11.6 g PPC

.303 cal. (.311")

Ref. 67711 130 gr/8.4 g SPSP
Ref. 67701 150 gr/9.7 g SPSP
Ref. 67713 180 gr/11.6 g SPSPBT

8 mm (.318")

Ref. 67901 196 gr/12.7 g SP-A¹⁾

8 mm S (.365")

Ref. 68013 108 gr/7.0 g FJRN
Ref. 68017 165 gr/10.7 g PPC
Ref. 68003 196 gr/12.7 g SP-A
Ref. 68007 196 gr/12.7 g PP-DC¹⁾

9.3 mm (.365")

Ref. 69304 154 gr/10.0 g FJRN
Ref. 69305 232 gr/15.0 g PPC
Ref. 69303 286 gr/18.5 g PP-DC¹⁾
Ref. 69315 286 gr/18.5 g SP-A²⁾

Pistol and revolver bullets
in boxes of 100.

.30 cal. (.308")

Ref. 67610 77 gr/5.0 g FJRN
Ref. 67612 93 gr/6.0 g FJRN¹⁾

.32 cal. (.314")

Ref. 67810 98 gr/6.4 g LWC

9 mm (.355")

Ref. 69031 96 gr/6.1 g FJRN
Ref. 69021 115 gr/7.4 g HP
Ref. 69010 116 gr/7.5 g FJRN
Ref. 69026 116 gr/7.5 g SPFN

.38 cal. (.357")

Ref. 69123 110 gr/7.1 g HP
Ref. 69110 148 gr/9.5 g LWC
Ref. 69101 158 gr/10.2 g HP
Ref. 69106 158 gr/10.2 g FJSWC
Ref. 69107 158 gr/10.2 g SPFN
Ref. 69112 158 gr/10.2 g LRN

.44 cal. (.430")

Ref. 61103 240 gr/15.6 g PC

NORMA UNPRIMED CASES

Rifle Cases

packed in boxes of 20.

22 Hornet ²⁾	Ref. 25601
220 Swift	Ref. 25701
222 Rem.	Ref. 25711
22-250	Ref. 25731
5.6x52 R	Ref. 25604
243 Win.	Ref. 26001
6.5 Jap.	Ref. 26531
6.5 Carcano	Ref. 26535
6.5x55	Ref. 26551
270 Win.	Ref. 26901
7x57 R	Ref. 27004
7 mm Rem. Magnum	Ref. 27021
7x64	Ref. 27012
7.5x55 Swiss	Ref. 27511
30 US Carbine ¹⁾	Ref. 27620
7.62 Russian	Ref. 27634
30-06	Ref. 27640
30-30 Win.	Ref. 27630
308 Win.	Ref. 27623
308 Norma Magnum	Ref. 27637
300 Win. Mag.	Ref. 27666
7.65 Argentine	Ref. 27701
303 British	Ref. 27711
7.7 Jap.	Ref. 27721
8x57 J ¹⁾	Ref. 27901
8x57 JS ¹⁾	Ref. 28001
9.3x62 ¹⁾	Ref. 29311

Pistol and revolver cases
packed in boxes of 50.

32 S&W Long	Ref. 27811
9 mm Luger	Ref. 29021
38 Special	Ref. 29110
357 Magnum	Ref. 29101
44 Magnum	Ref. 21101

1) Available until current stock exhausted.
2) In boxes of 50.

NORMA POWDER

Contents 500 grams per can, R-1 and R-123 250 grams.

Norma powder 200 (93200)

The fastest of the Norma rifle powders. Suitable for 222 Rem. and for light bullets in large calibres.

Norma powder 201 (93201)

Somewhat slower than 200. Suitable for 9.3 mm and similar large calibres where powder gases must fill a relatively large volume while the bullet moves through the barrel.

Norma powder 202 (93202)

is a faster burning powder than 204, suitable for loading cartridges in the medium ranges (7x57, 30-06, 8 mm etc)

Norma powder 204 (93204)

is a slow burning powder suitable for large case volumes and relatively small calibres. 204 is excellent for 270 Winchester etc.

Norma Magnum Rifle powder (93215)

is a special powder for Magnum rifle cartridges. It is also suitable for certain cartridge combinations outside the Magnum group, but it is important to follow closely the loading data given.

Norma R-1 powder (91101)

is a very fast burning powder for revolver cartridges. The powder flows easily and is very suitable for semi-automatic powder gauges.

Norma powder R-123 (91123)

is a slow burning powder for revolver cartridges, e.g. 357 and 44 Magnum with jacketed bullets. Burns as cleanly as R-1 and is equally easy to handle, but the slow rate of burning makes pressures lower and loading weights higher to give increased velocities.

NORMA PRIMERS

Primers are packed in boxes of 100.

Small Pistol Primer (84410)

for pistol and revolver cartridges, e.g. 38 Special, 357 Magnum etc. .175" dia.

Small Rifle Primer (84420)

.175" dia. of a similar construction to the LR primer. To be used in cartridges with small case diameters.

Large Pistol Primer (85310)

for large pistol and revolver cartridges, e.g. 45 ACP, 44 Magnum etc. .210" dia.

Large Rifle Primer (85320)

with .210" dia. and suitable for virtually all common rifle cartridges except 22 Hornet and 222 Rem.



Jaktmatch for your training

Training is necessary for humane hunting and accurate shooting. Jaktmatch is a pure training cartridge. Its manufacture incorporates the same painstaking controls as for all other ammunition, but thanks to efficient handling at all stages, the price can be kept lower and your training made cheaper. Using Jaktmatch you can afford to train more.

But one thing is very important. Before going hunting, your gun should be sighted in with the hunting cartridge of your choice. The point of impact between different types of cartridges can vary in your gun.

Jaktmatch is now available in seven different calibres and packed in boxes of 50.



Calibre	Ref.	Bullet type	Bullet weight		Bullet ref.	Velocity f/s		Energy ft lbs	
			grams	grains		V ₀	V _{100 yds}	E ₀	E _{100 yds}
222 Rem.	15715	Full jacket semi pointed	3,2	50	65702	3200	2610	1136	756
6,5x55	16528	Full jacket round nose	5,2	80	66522	3002	2436	1606	1057
30-06	17651	Full jacket pointed ²⁾	9,5	146	67602	2772	2555	2488	2114
30-06	17658 ¹⁾	Full jacket round nose ¹⁾	8,4	130	67677	2900	2450	2420	1727
308 Win. ²⁾	17622	Full jacket pointed	9,5	146	67602	2812	2592	2560	2175
8x57 JS	18009	Full jacket round nose	7,0	108	68013	2976	2167	2124	1126
9,3x57	19304 ¹⁾	Full jacket round nose ¹⁾	10,0	154	69304	2526	1987	2186	1353
9,3x57 ²⁾	19306	Full jacket round nose ²⁾	15,0	232	69306	2215	1989	2520	2033
9,3x62	19316 ¹⁾	Full jacket round nose ¹⁾	10,0	154	69304	2854	2275	2791	1773
9,3x62 ²⁾	19318	Full jacket round nose ²⁾	15,0	232	69306	2510	2268	3237	2643

1) Available until current stock exhausted. 2) Preliminary specification.



30-06



222 Rem.

6,5x55





Norma Gun Service Facility

For the benefits of our domestic shooters and hunters, Norma maintains a gun service facility well able to service all types of guns. Our technicians have many years personal experience of competitive shooting and hunting. The services offered include replacement of barrels and stocks, rebuilding of guns, mounting of sights and accessories.

308 Win.



9,3x57



9,3x62



8x57 JS



Leif gets Europe's biggest moose ever with Norma!

An exceptionally beautiful bull moose was the result of this year's moose hunt for a very fortunate Swedish hunter. His name is Leif Jacobsson and he has written us a letter recounting his experience.



”The first thing I saw when I came out of the woods on top of the ridge was the trophy. The bull had fallen so that the left side of the trophy stood on the ground leaving the other side raised in the air in all its majesty.

It is this impressive sight which more than anything else has stuck in my mind. Otherwise this day of the hunt began in a much less inspiring way. The ground was very wet. It had been raining for more than two days and had not yet ceased. Our team therefore decided to spend the day skinning and butchering moose which we had previously shot.

In spite of the unfavourable conditions, I left our cabin about 6 o'clock in the morning. On the way to my position, I saw two moose. The distance was too great to consider a shot and as they were moving away from me, time was precious. Without wasting any time, I crouched and ran in cover of the terrain parallel to their direction. After having run about 5-600 yards, I looked up over a small hill and saw that I was almost in line with them. The distance was about 150 yards and I knelt and fired immediately. The moose was clearly hit, but I put a second cartridge in the chamber and fired another round. The bull turned round and rushed towards the nearest cover. It was then, as I approached the edge of the forest, that I saw an unforgettable sight. The moose had fallen so that the gigantic antlers stood straight out of the ground. I could see that it was a magnificent trophy, but how large it was. I did not realize until we measured it back at the cabin. I am sure you realize that I am more than pleased, but I think that you people at Norma should take some credit. Without the fine ammunition you make, this letter might never have been written.

norma

FFV NORMA AB

S-670 40 Åmotfors, Sweden

Phone National 0571-30820

International +46571 30820



We reserve the right to change product specifications and designs without prior notice. All information presented in this leaflet is based upon results obtained in our ballistics laboratory and may vary from those obtained in individual firearms.